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AVIATION AND AIRCRAFT JOURNAL

Aerial View of a German Submarine in the Act of Submerging

VOLUME X
Number 21

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SPECIAL FEATURES

SHALL ENGLAND BUILD OUR BATTLEPLANES?
THE FRIESLEY FALCON CABIN AIRPLANE
"WHO'S WHO IN AMERICAN AERONAUTICS"
MOORING MASTS FOR AIRSHIPS
AIR MAIL USES STEEL BASCULE DOOR HANGARS

THE GARDNER, MOFFAT CO., INC.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

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Vol. X May 23, 1921 No. 21

Shall England Make Our Battleplanes?

SENATOR Boies Penrose, of Pennsylvania, has in effect proposed to turn American Aviation over to England and rely on English aeronautical engineering development for the strength of the aerial arm of the United States. He said in the Senate on Wednesday, May 11th, when speaking on Senator New's anti-dumping clause of the tariff bill, "Mr. President, this amendment was considered at the last moment by the committee on finance and was thought to be highly undefensible and undesirable. The only user or purchaser of airships is the Government, and there is no industry to amount to anything in the United States, properly so-called, making airplanes which cannot be subject of competition. Even if there should be private enterprises enlisted, it must be largely a monopoly furnishing the product to the Government. To attempt to tax the Government of the United States several hundred million dollars, is fostering an alleged American industry which is non-existent. If the American Government can go to England and get English airplanes for a few million dollars, it seems utterly indefensible. From whatever angle it is looked at the proposition does not seem to permit of any argument."

The above remarks cannot be interpreted in any other way than to mean that Senator Penrose would have the United States allow England to furnish us and Japan with airplanes inferior to their own latest types and place our air defense on a par with any other customer of English aircraft factories. In this connection it is significant to read C. G. Grey's comment on this subject in the March 23rd issue of *The Aeroplane*, our British contemporary. He gives the personnel of the British unofficial aviation mission to Japan to build up Japanese Air Force and concludes:

"Doubtless the United States will not be pleased with us for sending this mission to Japan, but let all good Americans remember that they themselves have barred us from selling airplanes in the United States, and that we must sell our products, human and mechanical, where we are allowed to do so. And, even if we do sell our knowledge of aviation and our airplanes to Japan, the fact will always remain that when war comes, the Americans will have our sympathy and moral support which will cost them nothing—except perhaps the cancellation of our war debt to the United States."

The simple arguments the Senator uses would lead to the United States having its artillery and armor plate made by Krupp instead of in Pennsylvania. It would turn over the building of battleships to English ship builders. Our rifles would come from France or Sweden and our powder from some other low bidder.

The National defense of the United States demands an industry which will be a reserve that can produce aircraft in peace time quantities with the possibilities of expansion in time of trouble.

The American people know we must be prepared in the air as well as on land and sea. Senator Penrose in his comments undoubtedly was thinking solely of economy, for it is inconceivable that an American Senator with a full knowledge of what is going on in the world, would turn over to foreign manufacturers the "eyes of the fleet" and the new first line of national defense.

Canada Prohibits Passenger Stunting

THE Canadian regulation which prohibits the stunting of civil aircraft carrying passengers is a measure which ought to have the most beneficial effect on the development of commercial aviation along safe and sane lines. It will be generally agreed that, barring unforeseen circumstances such as the necessity of side-slipping into a very small field because of its restricted dimensions, there is really no need or excuse for stunting passenger carrying aircraft. Aerobatics, when practised upon an unsuspecting passenger, may appear as the acme of fun to some pilots, but as a matter of fact—and quite aside from the possibility of an accident—the main result of such a practice is generally to disgust the passenger of further flights.

Of course, there are those who, though not aviators, like to go up for a session of loops, rolls and spins. They will be hard hit by this regulation. Most of these amateurs know enough about the mechanics of flight, by the way, to impress the pilot with the necessity of going up a few thousand feet before starting the circus. Thus they are less likely to indulge in real risks, for anyone who has enjoyed such aerobatics gets sufficient exhilaration out of them to dispense with the wish of shaving the roof of a hangar when coming into the field.

It is to be supposed that the Canadian regulation also applies to another sort of aerial aerobatics which does not properly belong to stunting. We are referring to the various exhibitions consisting in jumping from one airplane onto another, in climbing out on a wing or on the tail, etc. Such exhibitions have of late become more and more frequent, in fact, it would seem that the aerial acrobats who indulge in them are vying with one another in inventing more and more daring stunts.

That these aerobatics can have but one effect on the public, namely, to impress it with the extraordinary hazards of aviation, is obvious. As a consequence, the old belief that man should not fly because he was not born with wings is still lingering in the masses and in the mind of most men the person who goes up in an airplane is still looked upon as a sort of hero. Therefore, the sooner unnecessary stunting is put to a stop, the better it will be for the normal development of commercial aviation. To bring this about only one measure will prove really effectual: federal air legislation. A speedy enactment of the latter is therefore the greatest necessity of the moment.

The Anti-Dumping Amendment

The remarks on the anti-dumping amendment which Senator New wished added to the Tariff Bill have caused wider comment than just the tariff aspect of the matter. Senator Penrose's remarks are quoted on the editorial page.

The amendment as offered by Senator New provided that the appraisal value of aircraft imported into this country be based on the cost of production rather than on the one per cent of the original cost which the British interests paid their Government for the war material. Senator Boies Penrose defeated the amendment in the Senate, asserting that there was no American aircraft industry to amount to anything, and that the United States should go to England for its airplanes if it could get them more cheaply.

Captain Maurice G. Cleary, Directing Governor of the Aero Club of America, said in this connection: "Senator Penrose evidently was misinformed. There is an American industry, which has been in a critical state since the British monopoly, first tried to dump all its surplus and obsolete military planes into this country a year ago, and sent its lobby before the American Congress.

"I understand that the chiefs of the Army and Navy Air Services urged the passage of the New amendment on the grounds that the aircraft industry is most necessary to the Nation if we are to hope to maintain defenses in the air over land and sea.

"If a foreign nation is permitted to deluge the American aircraft market, the early destruction of the American aircraft industry is inevitable, and this industry constitutes our only source of supply in case of war.

Captain Cleary added that British missions have been attempting to create a market in other countries, but without success because of protective legislation similar to that which Senator Penrose's action last Wednesday defeated in the American Congress.

The telegram from the Aero Club addressed to the President read:

"Request that you advise whether Senator Penrose's opposition to American aircraft industry is in line with Administration policy of national defense in air. Unless Senator New's Amendment to Emergency Tariff Bill is adopted by conferees and passed, the key aeronautical industry will be in danger of destruction and America will be placed at the mercy of any foreign power."

Similar telegrams were sent to the Secretaries of Navy, and War, and members of Congress.

Senator New's Amendment

The amendment sponsored by Senator New reads as follows:

> (d) If it is established to the satisfaction of the appraising officers, under regulations established by the Secretary, that the foreign market value of airplanes, or airplane motors, parts, and accessories therefor, is wholly or partly based not upon cost of production or ordinary trade conditions of supply and demand but is based upon unusual access stocks procured or accummulated through artificial or abnormal conditions, then the foreign market value of such airplanes or airplane motors, parts or accessories for the purpose of this section shall not be less than the cost of production.

In introducing this clause Senator New said:

"It is a well-known fact that during the war Great Britain manufactured a great many airplanes. Like ourselves, they built up an industry for the manufacture of planes, but, unlike us, they continued to manufacture planes under contract with companies which had been formed for their production for several months after the armistice was signed, whereas we quit it absolutely with the signing of the armistice.

"The result was that Great Britain found herself with a very large number of surplus planes a year after the war. The British Government sold to the Aircraft Disposal Co. for $5,000,000 planes which cost them over $500,000,000 to manufacture, or for just 1 per cent of what it cost the British Government to make them.

"Under the other terms of the contract the planes were to be sold not in Great Britain, that being expressly excluded, but in any foreign country. A contract was made with people in the United States to bring them over here and sell them, and quite a large number of them were brought to the United States. It can be very easily seen how that sort of thing furnishes competition against which no manufacturing enterprise can possibly stand.

"A further feature of that contract was that the Aircraft Disposal Co. and its American agents might sell the planes at whatever figure they could get. No price was fixed upon them. The cost to that company was the 1 per cent of the cost of manufacture in England plus freight to this country and such little overhead as might be required to furnish selling machinery. If an American manufacturer put his plane on the market at a cost to him, say, of $5,000, he had in competition with him a plane which cost only 1 per cent of the $5,000 plus freight and overhead.

"Under an additional feature of the contract one-half of the profits he got for his plane went to the British Government. That is where the British Government came in. If the plane was sold for $500, the man who sold it, the agent here, took one-half of the profit himself—that is, what he got for it over the 1 per cent of cost of manufacture which he paid the British Government and the freight—and the other half went to the British Government.

"Hundreds of those planes were shipped from Great Britain to the United States for sale in this country. They were not put upon the market for one reason only, and that was because the American manufacturers appealed to the United States court, their appeal to Congress having failed, on the ground that the British planes are based upon an American patent, and the United States courts held very justly, I think, that they did infringe upon that patent. Some of those airplanes are today in bonded warehouses at eastern ports ready to be put upon the market here at any figure that their American owners can get for them the moment the temporary injunction shall be dissolved, if it ever is.

"I would not urge this amendment if I felt that the provision already in the bill intended or designed to prevent dumping covered this case, but it does not cover it; it does not touch it at any point. That provision bases the inhibition against importations and dumping upon the cost of production of an article abroad, whereas Senators can see at once from what I have said that the airplanes are not brought in here and sold with any reference whatever to the cost of their production abroad. They are sold at just whatever an American purchaser can be induced to pay. If it is ten per cent of the cost of production, well and good. If it is 20 per cent, that much better, but it can be sold at 5 per cent of the actual cost of production, and yet, presumably at least, yield to the man who sells it something in the way of a profit.

"I have sought to make clear, in the very brief time that I have had to present the subject, that the reason for the proposed amendment is not to protect somebody's business, but that it is to preserve in this country the nucleus, at least, of an industry which can be relied upon to produce aircraft in case of an emergency, in order that we may not be left exactly where we were in 1917 when we went into the war. No man is going to invest money in a plant intended for the construction of aircraft when he sees immediately before him somebody else producing the thing into which he is proposing to put his money who will offer the product at a ruinous percentage of what it will cost him to produce it. It marks, in my judgment, the abandonment of the little that is left of the aircraft industry in the United States if it has to face that sort of competition. It is for that reason, as I have said, for the protection of an industry here which is vitally necessary to the national defense, that I am urging the adoption of the amendment."

Senator Penrose in addition to his remarks quoted in our editorial added:

"I am not informed as to how many concerns may be assembling airplanes. That there are twenty concerns, and it may be a great many more, that make parts of airplanes, I have no doubt. I have yet to discover that airplanes are in general use. Certainly they are not yet used for pleasure like the automobile or for carrying garden truck or farm products. The Post Office Department, the War Department, and the Navy Department seem to be the only branches of the Government using airplanes. The committee were unanimous in the decision with reference to this amendment as being entirely indefensible."

Opening of Curtiss Flying Field

Opening of Curtiss Flying Field Attended by 10,000 Spectators. Laura Bromwell Makes 199 Loops. Varied Exhibitions of Aircraft and Parachute Descents.

The opening on May 15 of Curtiss Flying Field, formerly known as Hazelhurst Field, Mineola, Long Island, was the occasion of a successful exhibition of civil and military aircraft, in which Miss Laura Bromwell proved the star attraction.

The weather was ideal for flying and it attracted a crowd estimated at 10,000, which gave the field a festive air. When the exhibition started, a score of machines was lined up on the field, consisting of Curtiss Orioles, Curtiss Jennies, Curtiss

Miss Laura Bromwell

Standards, S V A. two-seaters and an Orenco D-3 pursuit machine. Several De Havilland mail stood in front of the mail hangars, enabling the public to have a glimpse of them. Later in the day a BaCo Skylark showed up, piloted by Bruce Eytinge.

The exhibition started at 1 p. m. with Bert Acosta who handled the Orenco pursuit machine in his usual brilliant style and gave a very fine demonstration of aerobatics, looping, spinning, rolling and contour chasing. Some of it was done at rather low altitudes and the public had all the thrills it could wish for. His example was so infectious that some of the "Jenny" pilots promptly set out to emulate him producing some startling zooms and climbing turns right off the ground. The absence of any mishaps is a credit to the mechanics who were in charge of the respective engines.

In the mean time a Farman "egg crate" appeared in the skies from the direction of Roosevelt Field and circled over the spectators with its characteristic lumbering gait and swishing propeller. The peculiar noise this propeller makes is due to the fact that the Renault engine of the Farman is fitted with a very effective silencer, so that the slowly turning propellar is clearly heard above the engine. This, together with the wind whistling in the many wires of the "egg crate", produces that curious sound. While the Farman was ambling along, the pilot suddenly surprised the onlookers by putting her nose down and landing with a sort of half spiral combined with a side slip. The thing was done so swiftly and the machine came to so short a stop that those who had watched the maneuver were amazed. What apparently happened was that the engine began missing and as the machine was fairly low down, the pilot, rather than risk being let down by the engine on rough ground, simply came down where he was. This is literally true, however amazing it may sound for this machine hardly rolled more than 30 ft. before coming to a stop—which is highly creditable to the low landing speed of the Farman.

The proceedings continued with a formation flight of three Orioles piloted by C. S. Jones, R. H. Depew and W. E. Gilmour and various passenger flights, while Lloyd Bertand took up for a short test the S V.A. destined for Miss Laura Bromwell. When he came down, Miss Bromwell climbed into the cockpit, took off, and having circled the field several times flew a measured course of 2 miles at the rate of 135 m.p.h., which is claimed to be a new speed record for women. Having landed and gotten out of the S V.A., which she handled very nicely, Miss Bromwell hopped into a Curtiss-Standard and treated the public to a remarkable demonstration of looping. Miss Bromwell last summer made 87 loops at Garden City, showing that she was no novice in the game, but last Sunday she far surpassed herself. Climbing to 8,000 ft. she started looping in full view of the public and kept it up until she had descended to 4,000 ft., when she again climbed to 6,000 ft. and resumed operations. This time she kept the machine turning over and over until she was about 400 ft. above the field, when she pulled out, circled the field once and made a perfect landing. According to the official count made by the special committee of the Aero Club of America her loops totalled 199, which somewhat disappointed the intrepid woman aviator who thought she had passed the 200 mark.

Miss Bromwell was quite fresh at the end of her looping exhibition and later piloted a machine from which William E. Copie made a successful parachute descent from an altitude of 3,000 ft. Another parachute descent was later made by Sergt. W. H. Spear of the 5th Aero Squadron, A. S., who jumped from a DH-4B and landed at Mitchel Field.

A comic intermezzo was provided later when it was announced that Madame Purcell, an opera singer, would make her first flight. The Madame climbed into the machine with the propeller turning over and before a pilot appeared the ship was off, careening down the field in a most disorderly fashion. This thing looked like sure disaster, when to the amazement of everyone the ship hopped into the air and went into a very aggravating performance. "Strong men wept and women fainted," when suddenly the ship came back over the audience and the Madame was seen waving a wig—it was Pilot William Purcell. With that the hair raising performance came to an end.

Toward the end of the meeting a graceful little biplane appeared in the skies and came down on the field. It was the latest American commercial airplane, the BaCo Skylark, piloted by Bruce Eytinge, and it carried as passenger G. B. Linderman, vice-president and chief engineer of the Bethlehem Aircraft Corp. The aerial travellers came from Bethlehem, Pa., in exactly one hour, with no incident to report en route.

The Friesley Falcon Cabin Airplane

The Friesley Falcon is a 12-passenger twin-engined plane of the Pullman Cabin Type The first public test flight was held Sunday April 17th, at Friesley Field, Gridley, Calif Considering the attendance, lack of accidents of any kind and the complete success of the Falcon's test flight, the event was one of the most successful ever held in California The crowd was conservatively estimated at 17,000 and when it is considered that Gridley is situated out in the heart of the Sacramento Valley, far from any city of size, the attendance is remarkable and shows the interest being taken in the aviation in Northern California. Visiting Army and civilian planes from Mather, Crissy, Durant and Redwood City Fields lent an aspect to the meet that made it compare favorably with meets held at some of the large airdromes. Among the visiting fliers were Capt. Eddie Rickenbacker, Capt. Lowell H. Smith,

WING AND CONTROL SURFACES

Total area main planes	847	sq ft
Area ailerons (each)	30	"
Number ailerons	4	
Area fin (each)	18	" "
Area, rudder (each)	16 6	sq ft.
Number, rudders	2	
Area, stabilizer	88	

WEIGHTS AND PERFORMANCE

Weight empty	8800	lb
Weight loaded	8600	lb
Weight per sq ft	9 3	lb
Weight per hp.	12 3	lb
Maximum speed	120	m p h
Minimum speed	55	m.p.h.
Climb to 5000 ft	4	min

A more detailed description follows:

The cabin is completely enclosed and houses twelve wicker chairs so placed that there is a space of 20 in between and

THREE-QUARTER FRONT VIEW OF THE FRIESLEY "FALCON" 12-PASSENGER CABIN AIRPLANE

Lieut. Halverson, Lieut Jones, Reed Chambers and A. Andrews

The Falcon left the ground after a run of less than 100 yd at a speed of 45 m.p.h and during its flight developed a speed of 90 m.p.h with motors throttled to 1500 r.p.m The balance proved to be perfect and the ease of control, glide and landing exceed the expectations of the designer The plane landed at 40 m.p.h and rolled less than 200 ft The success of this first public flight is all the more remarkable when it is considered that only two private test flights had been made and those on the day previous and of a duration of about 2 min each

The designing, building and flying was all handled by B M Spencer, former Air Service officer, lately stationed at McCook Field. Mr Spencer designed and constructed his first plane (a two-passenger machine) late in 1914 and flew it for some time prior to the war He is a Brown University man and in addition to his technical experience he has had 3,000 hours flying time and is also possessed of great mechanical ability, of which the workmanship embodied in the Falcon is remarkable evidence

The specifications are as follows:

POWER PLANT

2 Liberty 12 cyl. low compression engines

PRINCIPAL DIMENSIONS

Over all span	65	ft 3 in
" length	40	ft 0 in
" height	15	ft 0 in
Chord	7	ft 6 in
Gap	7	ft 6 in
Wing Curve	U S A 5	
Angle of Incidence top plane	8	deg
" lower "	2	deg
Dyralage (wings)	1	deg
Stagger	None	
Sweepback	"	
Dihedral	"	
Angle stabilizer to chord	1	deg
Range of adjustment of stabilizer	1 to 5	deg

as the body is 56 in in clear width a good wide aisle is to be had. The average large plane neglects the head room, which has been overcome in the design of the Falcon. The headroom in the clear is 5 ft 8 in allowing the average person to stand erect There is no cross bracing of any description allowing the body to be readily adapted to freight or express with few changes. The pilot's cockpit is in the extreme nose, and as this portion of the cabin extends out a considerable distance in front of the wings, the visibility is exceptionally good. Celluloid ports are also provided in the roof giving the pilot a good view overhead All instruments are arranged on a dash immediately in front of the pilot Storage batteries for the engines are placed under the dash and are readily accessible.

The fuselage truss wiring is made up of 3/16 in 3 per cent nickel steel rods, which threaded right and left hand and turnbuckle in clevises on each end Longerons are solid spruce from nose to tail post with bolted on the wire fittings Where the fittings fasten to the longeron is placed a hard wood block, glued and screwed and finally covered with tape

The tail end of fuselage is covered with plywood from the nose to a point immediately in the rear of the baggage compartment and from a point slightly in front of the tail skid section to the tail post. The intermediate portion of the fuselage is covered with fabric

The tail skid is of steel tubing hung to a frame, also made of steel tubing that fastens to all four longerons. The shock is taken up by means of cord

One of the most unique features of construction is to be found in the rudder control Instead of the conventional wires running into tha fuselage, allowing long flapping wires, tha control is conspicuous by its absolute lack of wires of any description Fastened to the rudder are short horns on which are pivoted two rods, these rods terminate in a semi circular sliding yoke of steel tubing, that slides back and forth through

SIDE VIEW OF THE FRIESLEY "FALCON" 12- PASSENGER CABIN AIRPLANE

a fitting mounted on tha tail post. This yoke is actuated by the rudder control wires, which are completely enclosed in the tail This allows a very clean cut tail structure and a minimum of resistance The elevator control wires pass out of the tail and lead directly to tha horns on the elevator, the total amount of exposed control wire being about two feet on each side

Rudders and ailerons are balanced. Aileron control wires are run along the leading edge of lower wing, the bottom wire continuing straight through and the wires to the wheel tapped on at a point just outside of the body

Fuel is carried in storage tanks under tha floor of cabin and is pumped to gravity tanks of 40 gal. each above the motors Tha overflow is fed back through sight gauges in tha pilot's cockpit

The oil tanks are situated on the engine hearers immediately back of the motors

The propellers used are Paragon of 9 ft diam and 7 ft. pitch

The bagage compartment is located aft of the passenger compartment and is 4 ft x 5 ft x 4 ft. in size.

The stabilizer is adjustable by means of two screws controlled from the pilot's seat by means of a hand wheel.

The landing gear is very substantial and is of the double yoke type, housing two Atlas spring wheel, two on each side directly under the engines Elimination of shock absorber cord and the weakness of construction using same have been successfully overcome.

Full results of the final tests will be published as soon as completed

Canadian Civil Aircraft May Not Stunt

Pilots of civilian aircraft which carry passengers are forbidden to stunt in the Dominion of Canada, as appears from the following amendment to the Canadian Air Regulations passed in Council on Dec 4, 1920:

"Whereas the chairman of the Air Board reports that accidents have occurred in the course of civil flying due to machines being stunted with passengers, at or without their special request;

"And whereas the technical officers of the Air Board state that there is no purpose in stunting in civil flying, and that its prohibition would be beneficial not only for the purpose of preventing accidents but also for the purpose of inducing a realization that civil flying does not involve or require the taking of risks;

"Therefore, his Excellency the Governor General in Council, on the recommendation of the chairman of the Air Board, is pleased to amend the Air Regulations, 1920, and the said regulations are hereby amended as follows

(a) No pilot of any flying machine shall unless he is alone therein permit or cause such flying machine to spin, roll, loop or execute any other evolution involving unnecessary risk.

(b) It shall be a defense to any prosecution under Section 4, sub-section 2 of the Air Board Act for a breach of the foregoing regulation if the pilot established that the dangerous evolution was performed without intention on his part and notwithstanding the exercise by him of reasonable care."

Santa Maria Flies Up the Hudson

The flying cruiser Santa Maria of the Aeromarine Airways, Inc., on May 9 flew from New York up the Hudson River to Albany in 1 hr 47 min flying time.

The boat took off at 9 30 off Eighty second street and next touched the water at Newburgh, where the Mayor, members of the Chamber of Commerce and others greeted the fliers She then flew to the capital and from there to Lake George whence the Santa Maria will proceed to Detroit by way of the St. Lawrence River and great lakes. On board were Admiral J C Peoples, U S N, Dr James W. Inches, acting Mayor of Detroit, William E Metzer, president of the Detroit Athletic Club; C F Redden, president of the Aeromarine Airways, Inc., a movie cameraman, Capt. T. L. Tibbs, pilot, and two mechanics

When the two engined flying cruiser reaches Detroit she will go into regular service between that city and Cleveland

S. M. Fairchild on a European Tour

Sherman M. Fairchild, accompanied by his father, recently left for London aboard the steamer Aquitania Mr Fairchild intends to make a most thorough survey of the progress of commercial aviation in Europe, with special consideration of the development of aerial photography. His trip will also take him through France and Germany

The Messrs. Fairchild have taken with them one of the latest model Fairchild automatic mapping cameras, which is equiped with the well known between-the-lens shutter. It is noteworthy that this shutter is the only one of its kind to be used in a camera of large size In Europe Mr. Fairchild will compare this camera with the foremost foreign designs. During his absence the new design will be given more rigid and exhaustive tests by the Fairchild Aerial Camera Corp., with a view to putting the camera on the market in the United States.

62 Squadron and 21st Wing, R.F.C.

If this should meet the eye of Capt. W. Beaver, M.C., late of 62 Squadron and 21st. Wing R.F.C., will he please communicate with Lieut Col. G. L. P. Henderson, M.C., A.F.C., 6 Cambridge Square, Hyde Park, London, W. 2 Any other members of that Squadron and Wing are also invited to communicate with Colonel Henderson, who is now in London

"Who's Who in American Aeronautics"

Every week, AVIATION AND AIRCRAFT JOURNAL prints the biographical sketch of men who are prominent in American Aeronautics. These sketches will be published later in pamphlet form. As so many of the officers change their stations often, it is believed that a semi-annual issue will be necessary. In compilations of this character many errors and omissions occur. It will be appreciated if corrections are sent to "Who's Who" Editor.

Edward Pearson Warner

WARNER EDWARD PEARSON, Professor, Aeronautics born, Pittsburg, Pa., Nov 9, 1894 son of Robert L. Warner and Anne (Pearson) Warner

Educated Public schools, Boston, A. B 1916, B S 1917, Harvard University, B S. 1917, M S. 1919, Mass. Inst of Tech

Aeronautical Activities Engaged in aeronautical work continuously since 1915, Assistant at M. I T 1917, Instructor at M. I T 1918, giving most of the aeronautical work in the special Army and Navy schools in aeronautical engineering, Aero Engineer, U S. Army, doing wind tunnel work and miscellaneous investigations in stability and stress analysis, 1917-1919, 1919-1920 Chief Physicist, National Advisory Committee for Aeronautics, in charge of aeronautical research at Langley Field Secretary, Committee on Aerodynamics, N. A. C A., 1919 to date, Associate Professor in Aeronautics, Mass Inst. of Tech., 1920 to date.

War Service Aeronautical Engineer, U S. Air Service.

Books Reports No 17, 20, 71, 73, 76, 76, 92, and 99 Technical Notes No 1, 3 4, and 6, National Advisory Committee for Aeronautics, also numerous magazine articles and papers reprinted in the transactions of societies. These reports deal chiefly on stability, stress analysis and free flight testing.

Member: Associate Fellow, Royal Aeronautical Society, Junior S A E American Society of Mechanical Engineers, Fellow, American Physical Society American Association for Advancement of Science Junior member Society Naval Architects and Marine Engineers Aero Club of America

Present Occupation: Associate Professor in Aeronautical Engineering

Address: Mass Inst. of Tech., Cambridge, Mass

George Everett Adams Reinburg

REINBURG, GEORGE EVERETT ADAMS, Major Air Service, born, Washington, D C, Sept 22, 1889 son of Louis C Reinburg and A V Reinburg married Sarah B Hunter May 1919

Educated Public schools, Washington, D C, Central High School Army and Navy Academy, George Washington University

Professional Commissioned 2nd Lieut., 9th U S Cavalry, April 22, 1912

Aeronautical Activities Pilot and Officer in Charge of Flying, 1st Aero Squadron Punitive Expedition, Mexico, 1916 organized several aviation schools in U S Commanded Bombardment Group on front in France

Flying Rating Junior Military Aviator, San Diego Calif, June 1916 Military Aviator

War Service Pilot, Pursuit Group on 1st Army front, Sept and Oct. 1918 organized and commanded 2nd Day Bombardment Group on 2nd Army front in France, Oct and Nov 1918

Books Manual, U S Air Service, Bombardment Pilot's Manual

Member Sigma Chi Fraternity Pan Hellenic Association

Present Occupation Major, U S Air Service

Address Wilbur Wright Field, Dayton, Ohio.

Henry A. Wise Wood

WOOD HENRY A WISE Inventor born New York City, March 1, 1866, son of Fernando Wood and Alice F (Mills) Wood, married Elizabeth O Brown 1891

Educated: Private schools

Professional Inventor of Autoplate and many printing machinery improvements

Aeronautical Activities Editor "Flying" from its founding till 1919, Governor, Aero Club, 1911 to 1921

War Service Member U S Naval Consulting Board (resigned)

Books 'Fancies' (poems), "The Book of Symbols," "Money Hunger"

Member New York Yacht Club Aero Club of America Society Naval Architects and Marine Engineers.

Present Occupation Engineer

Address 3d Madison Ave., home, 194 Riverside Drive, New York

Guy Gilpatric

GILPATRIC, GUY, Advertising born, New York, Jan 21, 1896 son of John Guy Gilpatric and May Gilpatric, married Louise Lesser March 27 1920

Educated Columbia Grammar School, New York

Professional Aviation, 1912-1917, Advertising, 1917, Army, 1917-1919, Advertising 1919 to date.

Aeronautical Activities Instructor Sloane Aeroplane Co, 1912-1915 Instructor and Tester Canadian Curtiss Co., Standard Aero Corp., Heinrich Aeroplane Co, at later dates established American Altitude Record with passenger at Dominguez, Calif., Nov 28 1912 on 40 hp Deperdussin Monoplane did considerable flying for private individuals and small concerns, exhibitions etc assisted in the design of several successful planes

Flying Rating American Pilots' License No 171 Aero Club of America

War Service 1st Lieut, Engineer Officer, 1st Aero Squadron, A. E. F., Aug 13, 1917 to Oct 1918 promoted to Capt., 1919 discharged Jan 1919

Present Occupation Advertising

Address 9 East 40th St., home, 48 Edgecombe Ave, New York City

Paul Nissen Montague

MONTAGUE, PAUL NISSEN, Real Estate, born Winston Salem, N C, Nov 16, 1890 son of M Montague and Estella (Nissen) Montague married, Juanita Davis, Aug. 25, 1919

Educated Salem Boys School, University of North Carolina

Professional 1912-1917, Automobile dealer, 1919 to date, Real Estate and Investments.

Aeronautical Activities Fall of 1915, Thomas Flying School, Ithaca N Y Oct and Nov 1916, Atlantic Coast Aeronautical Station, Newport News, Va enlisted S. E R. C., April 29 1917 at Memphis, Tenn Ashburn Field, Chicago, until June June July and Aug at Chanute Field, New R. M A. tests trained at Third A I C, A. E F Nov and Dec 1917 and Jan 1918, French School of Aerial Fire, Cazaux, France, Feb 1918 Ferry Pilot, March 3rd to April 15, 1918 First Air Depot Z of A, April 19 to May 14, flying various ships Ninety-fifth Squadron, First Pursuit Group, Toul Front, May 18 to June 20 Chateau Thierry Front and Aisne-Marne Offensive, July 1 to July 31, captured, prisoner of war

Flying Rating Reserve Military Aviator as per W D Personnel Orders No 70 dated March 24 1920 rating to date from Sept 22 1917

War Service Sergt. Air Service April 29 1917 to Sept. 12, 1917 1st Lieut., Air Service, Sept 12 1917 to Feb 4, 1919

Present Occupation Real Estate and Investments

Address Merchants Bank Bldg, home 101 So Cherry St., Winston Salem N C

Jacob Earl Fickel

FICKEL, JACOB EARL, Major, Air Service born, Des Moines Iowa Jan 21 1883, son of Joel Fickel and Maria M (Jackson) Fickel, married Marian Allison Feb 15 1912

Educated: Public schools, Des Moines, Iowa Des Moines College U S Revenue Cutter Service Cadet School

Professional Cadet U S Revenue Cutter Service Aug 4 1902 to Jan 31 1904 Private Corporal Sergeant 1st Sergeant, Company K., 27th Infantry March 10, 1904 to Feb 28 1907 2nd Lieut 29th Infantry Feb 11, 1907 1st Lieut., 29th Infantry, July 1, 1911 Capt 31st Infantry Aug 1, 1916, Lt Col Air Service Aug 16, 1918 Major A S S July 3 1920

Aeronautical Activities Performed first experiments in aerial gunnery in history Aug 1910 with Glenn Curtiss and Chas Willard; Graduate, Rockwell Pursuit School Oct 18 1918

Flying Rating Junior Military Aviator, Sept. 2 1918 Airplane Pilot

Member Army and Navy Club (Wash)

Present Occupation Major Air Service

Address Couch Bldg, Portland, Ore, home Vancouver Barracks, Vancouver Wash

Bruce Swomley Eytinge

EYTINGE, BRUCE SWOMLEY, Test Pilot, born, New Oxford, Pa., April 4, 1899 son of Anthony S Swomley and Ella (Neely) Swomley, married, Dorothy Dilworth, Sept 5, 1917

Educated Public schools, Gettysburg, Pa Morris High School, N Y, University of Toronto School of Military Aeronautics

Professional Salesman, 1910-1914, 1915-1916, invented three different Motor Roller Skates, equipped with single cylinder ½ hp. gas engine, twin cylinder, 1 hp. gas engine and the other powered by electric motors and storage batteries; entered automobile business in 1916

Aeronautical Activities April 1917, enlisted in automobile section of Quartermasters Corps, U S Army July, enlisted as (American) Cadet in Royal Flying Corps, solo flight, Oct. 14, 1917, Camp Mohawk Deseronto, Canada, completed flying course at Ft. Worth, Tex., commissioned 2nd Lieut. Feb 19 1918, as Flying Officer at Camp Leaside, Toronto, Canada, promoted 1st Lieut., April 1, 1918 instructing the Gosport system at Camp Rathburn, Deseronto, Canada, relinquished commission Nov 29, 1918, Dec 1918 became test pilot of Aircraft Engineering Corp. 1920, tested Pioneer plane with Ford motor tested Orenco 4 seater, tested 1920 model ACE single seater, tested side-by-side seater, Linderman plane has flown 14 types.

Flying Rating Royal Air Force Certificate Aviators Certificate, 1917, Aero Club of America

War Service Honorary Lieut., R. A. F., Nov. 29, 1918

Books 'Landing Field Guide and Pilot's Log Book 1920 Eytinge's Flying Guide' 1921

Member Aero Club of America, Capt., New York City Aerial Police

Present Occupation Sales and Advertising Manager of Bethlehem Aircraft Corp., Bethlehem Pa.

Address 92 Vanderbilt Ave home, 4554 Park Ave New York City

Charles Lanier Lawrance

LAWRANCE CHARLES LANIER Aero Engine Manufacturer born, Lenox, Mass., Sept. 30, 1882 son of Francis Cooper Lawrance and Sarah E (Lanier) Lawrance married Emily Margaret Dix, Aug 3 1910

Educated Groton School, Groton, Mass; M. A 1905, Yale University. 1910, Ecole des Beaux Arts, Paris, France

Professional Engineer, B L M Motor Car Co, 1907 built experimental 8 cylinder aviation motor, 300 hp., to Paris, France and developed the Eiffel No 32 Wing Curve, 1912-1916 Engineer, S S Pierce Aeroplane Co, 1916, President and Chief Engineer, Lawrance Aero Engine Corp, 1917 to date

Aeronautical Activities Joined Naval Militia, New York, for aviation duties 1916, rank of Ensign, was not mobilized because of engineering work which was then doing for Navy Department

Member Society of Automotive Engineers Aero Club of America Racquet and Tennis Club Knickerbocker Club Yale Club Westbrook Golf Club; Oc-co-nee Golf Club

Present Occupation President and Chief Engineer, Lawrance Aero Engine Corp.

Address 644 West 44th St, home, Bayshore, L I, N Y

Wadleigh Capehart

CAPEHART WADLEIGH Lt Com U S N, born Portsmouth, N H Sept 3 1888 son of Edward E Capehart and Sarah W Capehart married Elizabeth Hewlett Scudder June 10 1919

Educated Rogers High School, Newport, R. I; U S Naval Academy 1910

Aeronautical Activities Detailed to Naval Aviation, May 29 1914

Flying Rating: Naval Aviator's Certificate No 19 Heavier-than Air Pilot

War Service Commanding U S. Naval Air Station, Fromentine Vendee France, April 30, 1918 to Feb 1 1919

Member Army and Navy Club (Wash)

Present Occupation U S Navy (Aviation).

Address Navy Department, Washington, D. C; home 112 Willow Street, Brooklyn, N Y

Ralph Albion Drury Preston

PRESTON RALPH ALBION DRURY, Rubber Business, born, Natick, Mass, April 10 1890, son of Edward C Preston and Jennie P Preston

Educated Public schools, Natick, Mass, B S 1910 Mass Inst of Tech

Professional With the Goodyear Tire & Rubber Co., Akron, Ohio July 1910 to date

Aeronautical Activities Summer 1910 studied manufacture of aeronautical rubber products (balloon fabrics, etc) in Great Britain 1910-1915 in charge production and development aeronautical work, Goodyear Tire & Rubber Co Akron, Ohio, Aug 28, 1912, first flight in spherical balloon at Colorado Springs, Colo summer 1912-1914 Vice President and Pilot, Goodyear Aero Club, Akron Ohio July 4 1913 aide to R H Upson, winning National Championship Balloon Race Sept. 9, 1913 received F A I spherical balloon pilot certificate Oct 12, 1913, aide to R H Upson, winning Gordon Bennett International Balloon Race July 11, 1914, won with M D Tremelin aide National Championship Balloon Race, Feb-June 1917, supervisor of production of aeronautic goods at The Goodyear Tire & Rubber Co June 1917 to June 1919 Manager and Chief Pilot, Goodyear Balloon School, training first class of Navy officers of Naval Aviation detachment, Akron Ohio in operation of coast patrol dirigibles June 1919 to Sept 1919, service in U S N R F Oct 1919, pilot (Major Smith, U S M C in command) Dirigible C-1, first airship flight from Akron to coast, route via Washington to Rockaway

Flying Rating Free balloon pilot No. 49, Dirigible pilot No 8, Aero Club of America, Naval Aviator (dirigible) U S N R F

War Service Lieut U S N R F duty as test pilot and project engineer, attached to Bureau of C & R., Navy Department, Washington, D C., June 1918 to Sept. 1919

Member Aero Club of America, Society of Automotive Engineers, American Society Mechanical Engineers (Executive Committee Aeronautic Section)

Present Occupation With The Goodyear Tire & Rubber Co Akron, Ohio

Address University Club, Akron, Ohio

Bert Milton Atkinson

ATKINSON BERT MILTON Major Air Service born Newnan Ga., March 20 1889, son of Wm. Atkinson and Susie (Milton) Atkinson married, Helen Engel July 27 1917

Educated Public schools, Newnan, Ga. Georgia Military College University of Georgia

Professional Commissioned 2nd Lieut., Infantry February 11, 1911 assigned 6th Infantry transferred to 15th Infantry Aug 1916, transferred to Air Service June 5 1919

Aeronautical Activities Student, Signal Corps Aviation School San Diego Calif, Oct. 17, 1915 to June 1 1916, 1st Aero Squadron in Mexico June 1, 1916 to Dec 1916. Commanding 6th Aero Squadron March 1917 to Sept 1917, organizing and commanding 1st Pursuit Group (94th, 95th, 27th, 147th, Squadrons), June 1918 to Aug 1918 Commanding 1st Pursuit Wing, Aug 21, 1918 to Dec. 1918, Commanding Air Activities, Long Island, Feb 1919 to April 1919 Air Officer, Hawaiian Dept, June 1919 to Jan 1920, Commanding Mather Field, Aug 20 1920 to date

Flying Rating Junior Military Aviator; Military Aviator Expert Certificate No 54 Aero Club of America

War Honors Legion of Honor (French), Croix de Guerre Army Citation (French)

Present Occupation Commanding Officer, Mather Field.

Address Mather Field California

Walter William Meyer

MEYER WALTER WILLIAM Commercial Aviator born Chicago, Ill., March 21 1890 son of Caroline Meyer, married, Laurel Doremus, April 4 1919

Educated Public schools, Chicago, Ill., University of Illinois

Professional: National Biscuit Co. 1906 to 1910. National Packing Co., 1910 to 1912, Butler Auto Co., 1914 Directory Advertising, R H Donnelly 1914 to 1917

Aeronautical Activities: Ground school, Urbana, Ill Rich Field, Waco, Tex for primary training Ellington Field Houston, Tex. for bombing pilot training, May 1918, graduated as night bombing pilot made instructor on acrobatic stage, Jan 1919, in charge of the De Haviland Transformation Stage Kelly Field, Sept 1919 took the engineering course at A. S. M. S., became engineer officer of the 196th Squadron, later C O at present, at Fitzsimons General Hospital, Denver recuperating from break-down of health, still a 2nd Lieut., Air Service

Flying Rating Reserve Military Aviator, April 9, 1918, A. C of A. Aviator's certificate

Present Occupation About to become General Manager of the Eastern Airways Corp now organizing to operate a line of large ships between Chicago and New York.

Address Bunell, Colo

Giuseppe M. Bellanca

BELLANCA GIUSEPPE M. Aeronautical Engineer born, Sciacca, Italy, March 19, 1886, son of Andrew C Bellanca and Concetta N. Bellanca

Educated Sciacca public and high schools, Milan (Lombardy) Technical School Prof of Industrial Mathematics, 1916, Royal Institute of Milan

Professional Aeronautical Consulting Engineer, Aircraft Designer and Constructor since 1909, flyer since 1912, aeroplane instructor 1912-1916

Aeronautical Activities While student in Milan, started public experiments of aviation in March 1909, built in Milan, in collaboration with E Bassi and P. Invernizzi (1908-1909) a two seater pusher biplane with Zust motor, tested this machine Sept 1909 at the aviation field of Baggio near Milan designed in 1909 and constructed in 1910, at the Aerodrome of Taliedo, the first Tractor Biplane embodying the general characteristics of Tractor Biplane now generally used, designed and constructed in Brooklyn, 1911, a single seater parasol monoplane, learned to fly in this aeroplane without any assistance, at Mineola in 1912 was flying instructor for the Bellanca Aeroplane School at Mineola 1912 to June 1916, instructing an average of 11 pupils a year, used Bellanca Parasol Monoplane designed and manufactured in connection with the Maryland Pressed Steel Co., Hagerstown, Md., the Bellanca C. D Tractor Biplane and the Bellanca C. E. Tractor Biplane, Consulting Engineer of the Maryland Pressed Steel Co., 1917-1920, inventor of the Bellanca detachable turnbuckle

Member Aero Club of America.

Present Occupation Aircraft designer and manufacturer

Address: 1927 76th St. Brooklyn, N Y.

Howard Grant Rath

RATH HOWARD GRANT Banker, born, Ackley, Iowa, April 19, 1885, son of John Rath and Elizabeth (Moser) Rath

Educated Public schools and high school of Ackley, Iowa Lake Forest College A B 1907, Williams College

Professional Assistant Cashier, Rath State Exchange Bank, Ackley, Iowa, 1907-1909 partner of firm of Blankenhorn & Rath (investment bankers), 1910-1914 President, Howard G Rath Co (investment bankers), since 1914

Aeronautical Activities Acted as flight leading observer in First American Aerial Day Bombing Raid carried out against the Germans on June 12, 1918 at Dommary-Baroncourt, acted as flight leading observer with 96th Aero Squadron in Toul Sector from June 1918 until opening of St. Mihiel Offensive, also through St Mihiel Offensive and Meuse-Argonne Offensive up to Armistice acted as Operations Officer of First Day Bombardment Group through St. Mihiel and Meuse-Argonne Offensives

War Service: Attached to 96th Aero Squadron working in Toul Sector in the St. Mihiel and Meuse-Argonne Offensives from June 10 1918 until Armistice

War Honors: Distinguished Service Cross, Chambley, France, Sept. 13, 1918 citation "for extraordinary heroism in action between Chambley and Conflans France, Sept. 13, 1918 while acting as leading observer of a flight consisting of three airplanes, was attacked by fifteen enemy planes In spite of the fact that the formation was surrounded by an enemy five times as large, carried out the mission successfully and bombed the objective. In the return running fight, he and his pilot continued the unequal fight, and succeeded in returning to their airdrome with valuable information"

Member California Club University Club, Los Angeles, Calif

Present Occupation: President, Howard G Rath Co.

Address 910 Security Bldg; 3995 Wilshire Blvd, Los Angeles, Calif

Frederick Gallup Coburn

COBURN, FREDERICK GALLUP, Shipbuilder, born, Duluth, Minn., June 16, 1882 son of Ira Coburn and Minnie M Coburn, married Ethel Turber Vinal, Dec 21 1907

Educated Public schools of Duluth, Minn., U S Naval Academy M. S 1908, Mass Inst. of Tech.

Professional U. S. Navy, 1900-1906; U. S. Navy, Construction Corps, 1906-1919 Bethlehem Shipbuilding Corp., 1919-1921

Aeronautical Activities Manager, U S. Naval Aircraft Factory, 1917-1919

War Service: Building Seaplanes throughout the war

War Honors: Navy Cross, Nov 11, 1920

Member American Society of Mechanical Engineers Society of Naval Architects and Marine Engineers, Taylor Society

Present Occupation: Shipbuilder

Address: Bethlehem Shipbuilding Corp. Ltd.; home, 1006 Prospect Ave., Bethlehem, Pa.

Leo Gerald Heffernan

HEFFERNAN, LEO GERALD, Major, Air Service born, Larksville, Pa., April 24 1889 son of Andrew Heffernan and Mary (Connole) Heffernan, married, Jane Davis, Feb. 11, 1921

Educated Public and high schools, Plymouth, Pa., U S Military Academy, 1911

Professional 2nd Lieut., 6th Cavalry, June 13 1911 1st Lieut. Cavalry, July 1, 1916, Capt., Air Service, Sept. 9, 1916 Major, Air Service, May 15, 1917 Capt., Cavalry, May 15, 1917, Major, Cavalry July 1 1920

Aeronautical Activities Student, Aviation Section, Signal Corps, Dec 14, 1915, San Diego, Calif pilot, 1st Aero Squadron, Mexican Punitive Expedition, Aug 16, 1916. Capt J. M. A., Sept. 9 1916 pilot, 3rd Aero Squadron, San Antonio, Tex., April 3, 1917 C O Aviation Recruit Camp, San Antonio Tex May 18, 1917, C O., 12th Squadron, June 16, 1917. Officer in Charge of Training and C O Wilbur Wright Field, July 9, 1917 to Jan 18, 1918, Assistant Officer in Charge Flying, Taylor Field, Montgomery Ala., April 15, 1918 to July 9, 1918 Officer in Charge of Training and C. O Kelly Field, Tex., July 12, 1918 to Aug 31, 1918 Student observer and graduate 2nd A I C, Tours, France Oct. 8, 1918 to Nov 13, 1918, Corps Air Officer, 9th Army Corps, and commanding in order, 2nd Army Observation Group, 4th and 5th Pursuit Groups, 2nd Day Bombardment Group, Nov 14, 1918 to April 15, 1919 command Chapman Field, Fla., June 19, 1919 to Oct. 18, 1919; redetailed to Air Service, Aug 14, 1920, duty March Field, Calif., Oct 14, 1920 to Nov 9, 1920 command 1st Surveillance Group, El Paso, Tex., Nov 7, 1920 to date

Flying Rating Pilot, Aero Club, April 1916, Junior Military Aviator, Sept. 9, 1916, Airplane Pilot Jan 17 1921

Member Pennsylvania Military Order of Foreign Wars Army Mutual (Wash.)

Present Occupation: Commanding 1st Surveillance Group.

Address: Fort Bliss, Texas, home, 1119 Montana St., El Paso, Tex.

Harry Westervelt Gregg

GREGG, HARRY WESTERVELT, Major, Air Service, born, Randolph, Mass. Oct 3, 1879 son of William Gregg and Lura Anna (King) Gregg; married Harriet Hahn, Dec. 28 1907

Educated Newark Academy, Newark, N J., 1899 John C Green School of Science Princeton University, School of Applied Science, Columbia University

Professional: Private Corporal, and Sergeant, 9th U S V I, 1899-1901 served in Regular Army in all grades from 2nd Lieut. to Lt. Col inclusive since Feb 5, 1901

Aeronautical Activities C O Selfridge Field, Mt Clemens, Mich., Sept. 1917 to April 1918; Chief of Personnel Branch, Aviation Section Signal Corps and Chief of Personnel Division, Department Military Aeronautics to Aug 1918 C. O 1st Pr Brigade, A. G S D and Concentration Camp Garden City N Y., to Nov 1918 C O., A G S D and Concentration Camp to April 1, 1919 Executive Officer, Mitchell Field, N Y to July 1919 C O A G S D., Detroit, Mich to Oct 19 1919 C O., A G S D and Little Rock Air Intermediate Depot, Little Rock, Ark. to date.

War Service Army Philippine Insurrection 1899-1901, Pulijanes Insurrection, Philippine Islands, 1906 World War

Member Army and Navy Club (Wash.) Army and Navy Club (Manila, P I) Aero Club of America American Legion Veterans of Foreign Wars Sons of American Revolution

Present Occupation Commanding Officer, Little Rock Air Intermediate Depot.

Address Little Rock, Ark.

James A. Summersett Jr.

SUMMERSETT, JAMES A., Jr., Capt., Air Service born Florence, S C Aug 28, 1891 son of James A Summersett and Anna A Summersett, married, Blanche Loretta Galvin July 10 1919

Educated Columbia Grammar School; Columbia High School, Newberry College, Newberry, S C

Professional Enlisted in 6th Cavalry, Aug 31, 1911 discharged by purchase, Aug 1, 1915, enlisted in Cavalry, March 11, 1916, transferred to Aviation Section Signal Corps, April 5 1916, discharged to accept commission. March 19, 1917

Aeronautical Activities Student pilot, Tours, France Oct. 10, 1917 to Dec 26, 1917; day bombardment pilot at front, April 18, 1918 to Armistice commanding 96th Aero Squadron, Sept. 9, 1918 to Armistice, Commanding Officer, 1st day bombardment group from Armistice till disbandment

Flying Rating French Brevet.

Present Occupation Captain, Air Service.

Address Carlstrom Field, Arcadia, Fla., home, 2329 Park St., Columbia, S. C.

Plywood in Airplane Construction

By Armin Elmendorf, M. Sc., M. E.

Consulting Engineer, Haskelite Manufacturing Corp., Chicago

(Concluded from last issue)

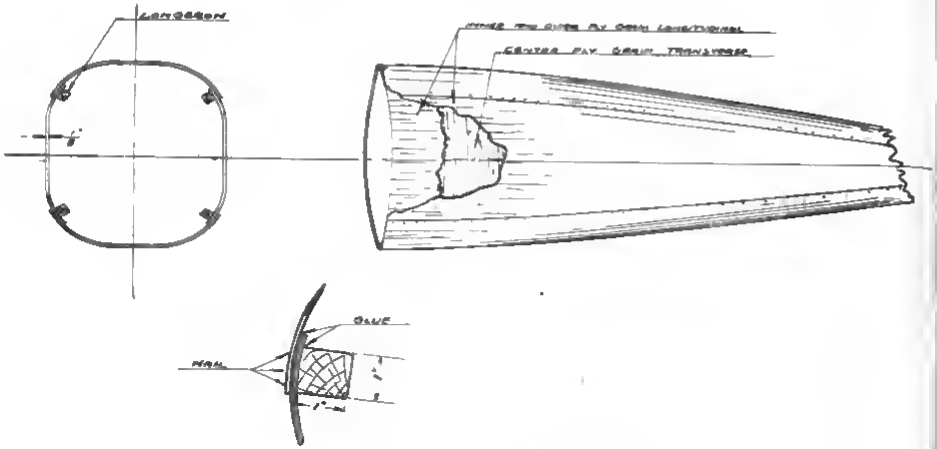


FIG. 4 CONSTRUCTION OF SEMI-MONOCOQUE FUSELAGE

Thin Plywood

Airplane designers sometimes call for plywood only 1/18 in. thick, or sometimes even thinner than this. Such material is used for wing covering or at times for fuselages. Plywood as thin as this has certain disadvantages. It is first of all not resistant to blows and is readily ruptured by being struck or by allowing some object to fall down upon the surface. A second disadvantage lies in the difficulty of manufacture if large sheets are called for. In order to make a 1/16 in. 3-ply panel, it is necessary to use 1/48 in. veneer. While veneer of this thickness is readily handled and glued together in small sizes, this is not true in sizes such as airplane designers sometimes call for. Veneer as thin as 1/80 in. may be obtained in poplar or Spanish cedar if the width is limited to 24 in. When panels are to be made of such thin stock, their widths should not exceed 24 in., if this is possible. If this is done the cost of manufacture, and with that, the cost to the consumer is greatly reduced.

Symmetrical Construction Necessary

In order to minimize tendencies to warp, it is necessary to glue the plies symmetrically. Symmetrical construction is obtained by using an odd number of plies, so distributed that for every ply on one side of the core there is a corresponding ply on the opposite side of the core of the same thickness and species, or species of about the same density.

Plywood should not be made with the grain of successive plies at any other angle than 90 deg. A deviation as small as 10 deg. from the standard 90 deg. construction may cause serious warping.

Plywood Fuselages

A designer confronted with the problem of designing a plywood fuselage must decide upon the species to use, the number of plies, the total thickness of the plywood, and the direction of the grain of the respective plies. The selection of species has already been considered. It will be recalled

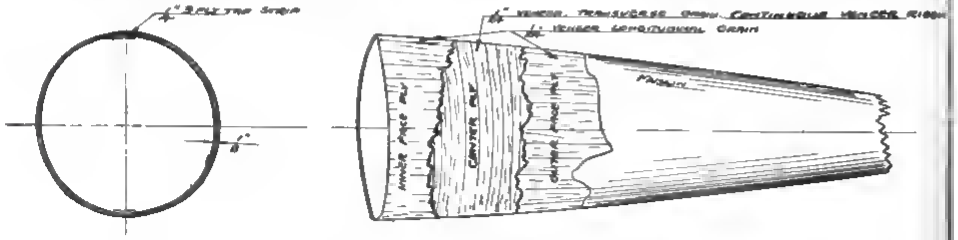
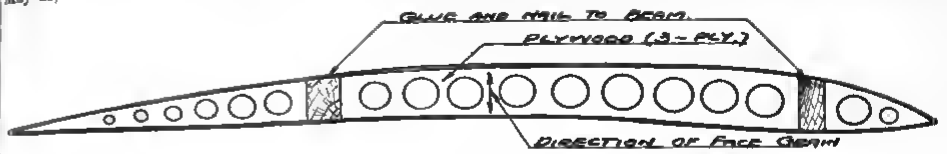


FIG. 5. MONOCOQUE FUSELAGE CONSTRUCTION



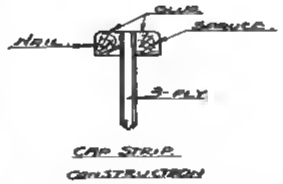


FIG 6 CONSTRUCTION OF WING RIBS FOR LENGTH UP TO 80 IN.

that low density woods were recommended on account of their superior resistance to buckling per unit of weight. Of the various low density species available in this country, yellow poplar and spruce are probably the most readily obtained.

Plywood for monocoque or semi-monocoque fuselages infrequently exceeds ¼ in. in thickness. There is, therefore, no advantage in using a 5-ply construction instead of a 3-ply. The former is more difficult to make and costs more than the 3-ply.

The plywood for a semi-monocoque type of construction, such as that shown in Figure 4, may range in thickness from 1/16 in. to 3/16 in., being thinner near the tail surfaces than around the cockpits. It is made in four sections which may each be made of several pieces scarfed and glued together, to give full length. The Haskelite Manufacturing Corp. molds the separate sections after softening them by boiling. The sections are pressed to form by heavy dies to conform to the fuselage curvatures.

A longitudinal lap such as that shown in Fig. 4, extending lengthwise of the fuselage, is usually not considered objectionable.

The construction shown in Figure 5 is that adapted to a true monocoque fuselage. In order to make a fuselage of this type, a form is necessary. It will be seen that the second or center ply is wrapped around the fuselage as a continuous narrow band or ribbon. In this way the standard 90 deg. or symmetrical construction is obtained. After the glue has set the fuselage is cut in two halves and the mold or form is withdrawn. The two halves are then placed together again and a plywood lap strip is screwed and glued to the inner face as shown.

The greatest stresses in a fuselage are obtained in the longitudinal direction, so that it is imperative to have the face plies extend in this direction. By wrapping the face plies at odd angles, as is done by spiral wrapping, the resistance to buckling is somewhat compromised.

Except for plywood as thin as 1/16 in., no appreciable strength is contributed by incorporating cloth between the plies. For very thin plywood, cloth between the plies increases the toughness or resistance to blows.

Wing Ribs

Considered from the point of view of great strength, and also from the point of view of facility of manufacture, the design for short airplane wing ribs shown in Figure 6 gives very satisfactory results. For wing ribs longer than about 80 in., other types of construction give superior results. The ribs should be 3-ply, and for the maximum length of 80 in. it need in general not to be thicker than 3/16 in. The core should be about one-half the total thickness and the face grain should extend vertically, that is, at right angles to the length of the rib. The cap strips are in two parts and are fastened by nailing and gluing to the faces of the web. Ribs greater than 80 in. in length give better results when made as shown in Figure 7. The entire web section extending from beam to beam is made in one piece of plywood and the openings between diagonals are sawed out. In order to prevent

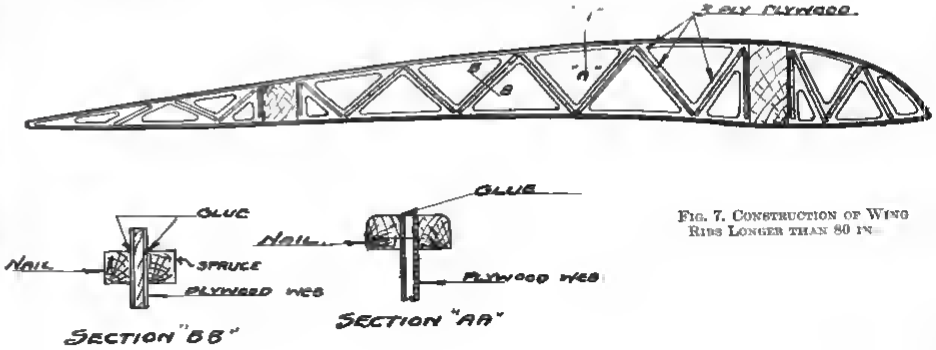


FIG. 7. CONSTRUCTION OF WING RIBS LONGER THAN 80 IN.

collapse or buckling of the plywood diagonals, it is necessary to reinforce these on the side with strips of spruce glued and nailed on. The plywood should as a rule not be less than 3/16 in. thick. The advantage of this type of construction lies in the fact that the usual difficult joints in the ends of the diagonal members are eliminated. This rib is readily manufactured in comparison with most other types of truss ribs used on wings of large chord lengths.

Wing Beams

Many tests have been made on wing beams of box sections or I-sections, each of which involves the use of plywood

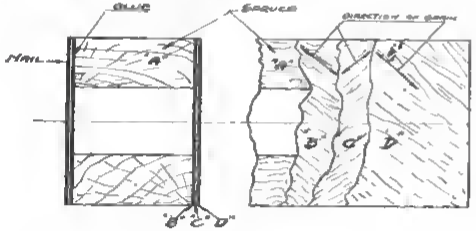


FIG. 8 BOX SECTION WING BEAM, PLYWOOD WEBS

The results obtained from tests on such wing beams have frequently been disappointing. This was due to the fact that the direction of the grain of the plies was not considered in designing the beam.

The shear strength and shear modulus of elasticity of the plywood web in a wing beam is of considerable importance. Tests made at the Forest Products Laboratory to determine the variation of shear strength and stiffness with the direction relative to the face grain showed that in a direction of about 45 deg. to the face grain the shear strength may be more than three times as great as the shear strength parallel to the face grain. (See Figure 10.) When this factor is considered in the design of box section wing beams, decidedly superior results are obtained. It is desirable, therefore, to build the plywood in a box beam, as shown in Figure 8. It will be seen that the grain of the plies is at about 45 deg. to the length of the beam. Such a beam is also very much stiffer than those in which the face grain is parallel to or at right angles to the length of the beam.

Bulkheads

Veneer that is thicker than 1/8 in. should in general not be used for bulkheads or engine bearers. On the other hand,

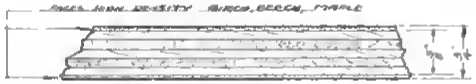


FIG. 9 BULKHEAD OR ENGINE BEARER CONSTRUCTION

thin veneer, such as 1/20 or 1/24 in. stock, requires so many plies that the construction becomes expensive. The best results are obtained as a rule by making the entire inner section, irrespective of the number of plies of low density wood, such as spruce or yellow poplar. The faces may be made of a hard wood, such as birch or maple, in order to give better bearing surface for the fittings. The bulk heads used to support the motor, commonly referred to as engine bearers, are usually from 5/8 in. to 1 in. in thickness. Figure 9 shows a desirable construction.

Plywood Wings

In all-plywood wings the covering functions not only as a surface but it also contributes to the strength of the wing. In order to take advantage of the strength of plywood, it is necessary to re-design the wing frame so as to throw stresses into the covering and thereby cause it to contribute to the strength. This may be done by using a series of longitudinal webs in a manner very similar to the lightening of the web of the plywood wing rib. These longitudinal webs are placed relatively close together, using possibly three webs to take the place of each wing spar. It is necessary to give the wing covering considerable support so as to prevent depressions or irregularities in the surface. The wing ribs may be made very light.

Plywood Covering

A comparatively thin plywood covering may be used. If the supporting cap strips are close together a 3-ply covering 1/16 in. thick may give entire satisfaction. Such covering may be lapped, thereby eliminating the difficulty of scarfing and making it possible to build the wing surface up in sections, which are small and therefore more readily made and handled. If, however, it is desired to eliminate the laps, then it is necessary either to provide a foundation on which to glue the plywood covering in case very thin stock is used, or it is necessary to use a thicker plywood. In order to make the panel conform to the curvature of the wing, it is necessary first to soften it by hot water and to bend it over a form upon which it is allowed to dry. The face grain should extend in

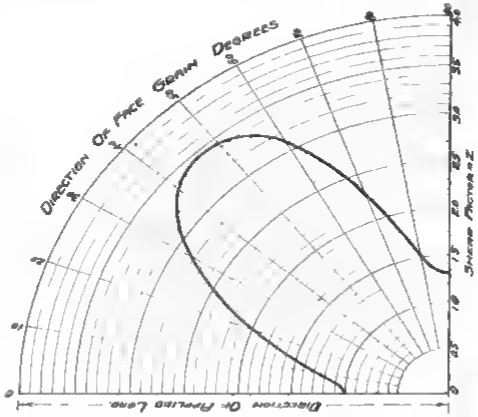


FIG. 10 CURVE SHOWING VARIATION OF SHEAR STRENGTH WITH DIRECTION OF SHEAR FORCES RELATIVE TO THE FACE GRAIN OF PLYWOOD

the direction in which the maximum stiffness is desired, that is, parallel to the longitudinal webs or length of the wings. The weight of any combination of commercial veneers may be obtained by means of the weights per sq. ft. given in Table II.

Fireproofing Plywood

There are two methods in which plywood may be fireproofed. It may be impregnated with a fireproofing solution or painted with a fire-resistant paint. Either method will give protection against the spread of a flame. Panels treated in this way will not support combustion. A 20 per cent solution of magnesium chloride and zinc chloride has been found to give very good fire resistance. The plywood is placed in a boiling solution for about 10 min. and then allowed to remain in the solution while it cools for 20 min. After treating, the panels are dried in the air.

Good fireproofing paints are now commercially available. As a rule, painting is a more practical method for obtaining fire-resistance.

TABLE II WEIGHTS OF VENEER

In Ounces per Square Foot of One Ply — Veneer Thickness in Inches

SPECIES	Sp. Gravity Oven Dry based on Volume	Air Dry Moisture Air-Dry content per cent	1/100	1/80	1/64	1/60	1/48	1/40	1/32	1/28	1/24	1/20	1/16	1/12	1/10	1/8	1/6	3/16	1/4
Ash, Black	.50	16.4	.42	.52	.65	.63	.76	.67	1.04	1.30	1.43	1.74	2.08	2.60	3.47	4.16	6.20	6.24	8.31	10.41
Ash, Commercial White	.56	9.9	.48	.60	.75	.80	.98	1.00	1.21	1.51	1.72	2.01	2.41	3.02	4.02	4.52	6.04	6.08	9.05	12.06
Basswood	.32	6.4	.32	.40	.46	.53	.65	.66	.78	.93	1.13	1.32	1.58	1.88	2.64	3.16	3.96	6.28	6.54	7.08
Beech	.54	11.2	.43	.56	.82	.87	.65	1.09	1.31	1.64	1.97	2.18	2.62	3.28	4.37	5.24	6.56	6.74	6.54	16.16
Birch, Yellow	.63	9.6	.52	.64	.82	.87	.86	1.08	1.39	1.64	1.97	2.16	2.62	6.28	4.37	5.24	6.56	6.74	6.64	16.12
Butternut	.36	7.6	.32	.41	.51	.54	.53	.66	.81	1.02	1.16	1.36	1.62	2.06	2.71	3.25	4.06	6.42	6.08	6.16
Cedar Spanish	.57	7.6	.51	.59	.48	.61	.56	.64	.77	.96	1.10	1.28	1.54	1.66	2.56	3.08	3.85	6.13	6.77	7.70
Cherry Black	.51	6.2	.42	.53	.56	.71	.77	.68	1.06	1.53	1.77	2.12	2.65	3.54	4.25	5.31	7.08	7.97	10.62
Chestnut	.44	8.6	.37	.46	.57	.61	.67	.78	.93	1.14	1.31	1.52	1.86	2.26	3.06	3.67	4.58	6.10	6.87	9.16
Cottonwood (common)	.49	4.7	.36	.45	.50	.60	.65	.76	.90	1.12	1.29	1.49	1.76	2.24	2.68	3.99	4.47	6.67	6.71	6.66
Cypress bald	.44	6.0	.37	.46	.57	.61	.67	.76	.92	1.14	1.61	1.52	1.86	2.26	3.06	3.67	4.54	6.10	6.86	6.16
Douglas Fir (Wash. & Oregon)	.61	6.2	.42	.53	.66	.71	.77	.68	1.06	1.63	1.81	1.77	2.12	2.65	3.53	4.24	5.30	7.08	7.96	10.6
Douglas Fir (Mont. & Wyoming)	.54	6.4	.37	.46	.57	.61	.67	.76	.92	1.15	1.61	1.56	1.82	2.39	3.06	3.66	4.58	6.10	6.87	9.16
Elm, White	.51	8.6	.42	.53	.66	.71	.77	.68	1.06	1.53	1.77	2.12	2.65	3.54	4.69	5.31	7.08	7.97	10.62
Gum Black	.52	7.2	.46	.54	.88	.72	.76	.80	1.28	1.53	1.80	2.17	2.71	3.61	4.84	6.46	7.22	9.12	10.83
Gum, Cotton	.52	6.1	.43	.54	.88	.72	.76	.80	1.06	1.36	1.55	1.80	2.17	2.71	3.61	4.34	6.42	7.32	6.12	10.82
Gum, Red	.46	11.6	.41	.51	.64	.66	.74	.89	1.02	1.28	1.46	1.70	2.04	2.56	3.40	4.06	6.10	6.80	7.64	10.20
Hackberry	.54	6.2	.45	.56	.70	.79	.82	.84	1.12	1.40	1.61	.87	2.65	2.81	3.75	4.49	5.63	7.50	6.44	11.64
Hemlock, Western	.42	6.6	.35	.44	.56	.58	.64	.73	.87	1.03	1.25	1.46	1.76	2.18	2.91	3.50	4.67	6.66	6.56	8.76
Magnolia (Evergreen)	.61	8.6	.42	.53	.66	.71	.77	.68	1.06	1.53	1.77	2.12	2.65	3.54	4.24	6.30	7.06	7.96	10.6
Mahogany Central American	.46	7.9	.41	.51	.65	.64	.79	.85	1.02	1.26	1.46	1.70	2.04	2.55	6.50	4.06	6.10	6.80	7.66	16.20
Mahogany African	.48	8.0	.48	.48	.60	.64	.70	.80	.96	1.16	1.37	1.58	1.91	2.38	3.16	3.86	4.76	6.66	7.17	9.67
Maple Silver	.48	8.3	.40	.50	.62	.67	.76	.83	1.00	1.25	1.43	1.67	2.00	2.50	6.66	4.00	6.00	6.66	7.50	7.00
Maple Sugar	.62	10.5	.62	.66	.81	.86	.64	1.06	1.29	1.61	1.95	2.15	2.58	3.23	4.60	5.16	6.46	6.60	6.49	12.61
Oak, Commercial Red	.64	10.7	.63	.67	.84	.86	.67	1.11	1.38	1.80	1.60	2.22	2.66	3.33	4.44	5.72	6.76	6.88	6.66	16.3
Oak Commercial White	.64	11.0	.67	.71	.88	.64	1.03	1.18	1.41	1.77	2.02	2.36	2.83	3.64	4.72	5.66	7.08	9.46	10.61	14.1
Pine, Longleaf	.66	6.3	.65	.66	.86	.62	1.00	1.17	1.46	1.72	1.96	2.34	2.71	3.44	4.56	5.50	6.66	9.16	10.32	18.76
Pine, Sugar	.37	11.4	.31	.66	.46	.51	.66	.64	.77	.66	1.10	1.28	1.64	1.92	2.67	3.06	3.86	6.14	6.78	7.70
Pine, Shortleaf	.54	11.9	.45	.66	.70	.75	.82	.94	1.12	1.40	1.80	1.87	2.25	2.81	3.74	4.46	6.62	7.49	6.46	11.2
Pine Western Yellow	.41	10.6	.64	.45	.63	.67	.62	.71	.83	1.07	1.23	1.43	1.71	2.16	2.64	3.41	4.27	6.66	6.40	6.64
Pine White	.36	9.6	.33	.41	.61	.64	.56	.66	.81	1.02	1.16	1.65	1.62	2.06	2.71	3.26	4.06	6.42	6.09	6.12
Poplar Yellow	.41	6.1	.64	.43	.53	.57	.62	.71	.85	1.07	1.22	1.47	1.71	2.13	2.64	6.41	4.27	5.69	6.40	6.64
Spruce Mike	.36	6.6	.32	.40	.49	.62	.58	.66	.76	.96	1.13	1.32	1.66	1.96	2.64	6.16	6.96	6.28	6.64	7.64
Sycamore	.50	9.2	.42	.52	.65	.66	.76	.87	1.04	1.30	1.46	1.73	2.08	2.60	3.47	4.16	5.20	6.24	7.62	10.41
Tanguile (Philippine Mahogany)	.64	11.6	.65	.56	.70	.75	.82	.94	1.12	1.40	1.60	1.87	2.25	2.81	3.74	4.46	5.62	7.46	6.43	11.2
Walnut Black	.57	6.8	.47	.59	.74	.76	.86	.96	1.16	1.48	1.70	1.98	2.37	2.87	3.66	4.75	5.94	7.92	6.91	11.87

Weight of glue per square foot: Blood Albumen about 0.3 oz.
Certus about 0.4 oz.

Sample: To get the weight of a square foot of 5 plywood consisting of 1 ply of 1/12-in. basswood, 2 plies of 1/16-in. basswood, and 2 plies of 1/20 in. yellow birch for faces, at 12 per cent moisture glued with Certus glue. Weight = (1 × 2.64 + 3 × 1.88 + 2 × 2.62) 1.12 + 4 × 0.4 = 14.86 oz.

The weight of wood is quite variable so that while the table given represents the average weights of material tested at the Laboratory large variations from these figures may be expected in individual pieces of veneer.

The example above is slightly in error through neglecting the change in volume between the moisture content at 12 per cent and the moistures listed in the table.

A Foreign Commercial Airplane

WESTLAND CABIN AIRPLANE USED ON THE AIR ROUTES OF THE INSTONE AIR LINE OF LONDON. THE CABIN SEATS FIVE PASSENGERS

Captain William Adger Moffett, U. S. N.

Director of Naval Aviation

Captain Moffett recently assumed the directorship of Naval Aviation at the Navy Department, Washington. He begins this existing duty unusually well equipped by reason of his experience during 31 years as an officer in the U. S. Navy.

Captain Moffett is perhaps best known by reason of his services as Commandant of the Naval Training Station, Great Lakes, Ill., and as Commandant of the 9th, 10th, and 11th Naval Districts. For Great Lakes trained, during the War,

Capt. W. A. Moffett, Director of Naval Aviation

about 250,000 enlisted men; and from the Districts which Captain Moffett commanded, over 300,000 enlisted men were added to the Navy, or more than 40 per cent of the entire enlisted personnel of the Navy during the War.

Captain Moffett was decorated with the Distinguished Service Medal for his services during the World War, the citation reading:—

"For exceptionally meritorious service in a duty of great responsibility as Commandant of the 9th, 10th, and 11th, Naval Districts and Commandant of the Great Lakes Training Station."

Captain Moffett was born in Charleston, S. C., Oct. 31, 1869, and was appointed to the Naval Academy on Sept. 6, 1886, completing the four years course and two years at sea, following which he was commissioned an Ensign, to rank from July 1, 1892.

Captain Moffett served at sea in the following naval vessels: The Portsmouth, Chicago, Constellation, Enterprise, Mohican, Charleston, Calgon, Baltimore, Monongahela, Kentucky, Marietta, St. Mary, Minneapolis, Maine, Amphitrite, Maryland, Arkansas. He commanded the Maine in 1913, and then the Chester, and while in command of the Chester, participated in the capture of Vera Cruz. He was detached from the Chester to duty at Great Lakes on Aug. 25, 1914, and on Nov. 23, 1918, following the Armistice, he was ordered to the command of the Battleship Mississippi, he was detached from the command of that ship on Nov. 12, 1920, and received his present appointment.

Other shore duty to which Captain Moffett was assigned includes duty at the War College, Newport, in 1896, and again in 1906; Captain of the Yard at Guantanamo, Cuba; in the Bureau of Equipment, now Bureau of Engineering, Navy Department; Inspector of the 18th Light-house District, San Francisco, Cal., and Inspector of the U. S. S. Arkansas in 1912, at the works of the William Cramp and Sons Ship and Engine Building Co., Philadelphia, Pa.

Captain Moffett, for heroism, in the Battle of Vera Cruz, on April 21st and 22nd, in 1914, was awarded a Medal of Honor, the citation being as follows:

> "Commander Moffett brought his ship in the inner harbor during the night of the 21st without the assistance of a pilot or navigational lights and was in a position, on the morning of the 22nd, to use his guns at a critical time with telling effect. The skill of Commander Moffett in mooring his ship at night was especially noticeable. He placed her nearest to the enemy and did most of the firing and received most of the hits."

It is especially fortunate for the Navy that an officer of Captain Moffett's attainments has been placed at the head of Naval Aviation. Enthusiastic, able, experienced, an inspiring leader and brilliant executive, under his direction it may confidently be expected that new impetus will be given the aeronautical branch of the service.

Promising Transport Plane Nearing Completion

Early in June test flights of the Airliner Engineering Co's large twin Liberty engine passenger and freight carrying plane will be made at Hazelhurst Field, Long Island, unless unforseen delays prevent. An inspection on May 6 revealed the machine as 90 per cent completed. Two Liberty-12 engines of Mumon manufacture have been received from the Air Mail Service. These engines are new and in splendid condition.

Great interest is being shown in the novel construction of this machine. Authorities who have examined it are impressed with its sound engineering principles and excellent workmanship. Duralumon has been used to a greater extent than any other airplane built in this country.

The Air Transport Co., whose plans anticipate operation of commercial air lines on an extended scale, are interested in the Airliner Engineering Co.'s new plane, as it is designed to carry from 25 to 30 passengers or their equivalent in freight, with a range of from 500 to 600 miles. W. L. Brackett, of the Air Transport Co., stated to an Aviation representative that if the machine comes up to expectations his company will place orders for a number of the planes.

The Air Mail Service will also watch the performance of the Airliner machine, believing that it will prove of value in that service. Photographs, drawings, and descriptions of the new airplane will be published as soon as flight tests are made.

S. E. Knauss with Stout Laboratories

Stanley E. Knauss, who for the last two years has been sales and advertising manager for the Continental Aircraft, Incorporated, has been made sales manager of the Stout Engineering Laboratories, Inc., Detroit, and will assume his new duties immediately, according to word from Chicago. Production on the new Stout commercial aeroplanes will begin soon in the Detroit plant on Beaubien street.

Mooring Masts for Airships

With the arrival of America's first rigid airship, the ZR-2, nearing, tentative plans calling for her flight across the Atlantic in mid-summer, arrangements for handling her in this country are being rushed.

At Lakehurst the Navy is building a huge hangar to accommodate the ZR-2 and her sister ship the ZR-1 which is to be constructed there. This will be the only place in the United States with accommodations for an airship of the size of these and the first consideration is being given to provide for anchorages for them at various places.

To meet this problem the mooring mast has been developed and it has reached the stage of development where aeronautical authorities claim it has increased the value of rigid airships for commercial purposes 500 per cent, and reduced the expense of operation of such ships 100 per cent. Where, heretofore, it has been necessary to provide huge hangars to house rigid airships at all terminals and intermediate stations where transference of passengers and freight took place, the mooring mast supplies a quick, safe, and economical means for carrying out these operations wherever desired.

Even medium sized towns along main aerial transport lines may now be linked up and used as way stations by the mere provision of a latticed steel mast from 100 to 150 ft. high, provided with an elevator for conveying passengers, freight and express from the ground to and from the airship.

The great features of this "mooring out" proposition is the fact that where it requires from 300 to 400 men to moor a ship on the ground, or to "walk" her in and out of the hangar, six men only were required to manipulate the mooring apparatus on the new mast. In the winds of the highest velocity only ten men were required.

The mast itself is a web-steel structure 115 ft. in height, with a revolving circular platform housed-in at the top, and above the platform a mooring apparatus in cylindrical form swung on gimbals which permits the ship when moored to sway with the wind and swing to all points of the compass.

In addition to an elevator for passengers and freight purposes, the mast contains pipes for furnishing water ballast, gasoline, lubricating oil, and lifting gas for the airship.

In the Spring of 1919 the British Air Ministry carried out tests with a mooring mast. A rigid airship was moored to this mast for two months, riding out storms and winds in perfect safety. Since then remarkable improvements have been made in the mast, and, ever since Feb. 2, 1921, the rigid airship R-33, sister ship of the R-34, which crossed the Atlantic to the United States in 1919, has been moored to one of these masts.* She has ridden out gales when the wind reached a velocity of 90 m.p.h., and she has been moored and released from the mast at wind speed as high as 50 m.p.h. without damage or mishap.

The method of mooring is extremely simple. When an airship approaches a mooring mast a cable, which runs from a winch from the ground up the mast and through the cylinder, is led down again to the ground and out to a point about 600 ft. from the mast in the direction from which the airship is approaching. Two men stand by the end of the cable, one man at the winch, and three to five others in the top of the mast. They transmit signals and operate the cables and machinery.

The airship approaches the end of the cable lying on the ground at a height of about 500 ft., her mooring being let down in a loop. When the loop is over the end of the cable stretched out on the surface, the outboard end of the cable is dropped to the ground. It is then shackled up to the mooring mast cable and at a signal from the men on the ground, ballast is discharged from the airship until she is about two tons light, and trimmed down at the stern. She then rises to a height of about 1,200 ft. above the trim.

At a signal from the airship, "Haul down", the winch is started and the cable draws the airship down toward the head of the mast. When the airship is about 500 ft. above the top of the mast two other cables about 500 ft. long are let out, leading from the bow of the ship, and these cables are secured to two surging cables on the mast and the ends of the two cables are drawn up by lead lines to the forward hatch of the ship.

From then on, a strain is maintained on all three cables and the airship drawn down until a cone on her bow fits into a cone on the top of cylinder of the mooring mast. When the two cylinders are firmly "set home", locking springs lock the ship to the mooring mast.

An airship moored to a mast must always be kept trimmed down by the stern. And this is also true when landing or getting away, otherwise gusts of wind downward on the bow of the ship would throw her stern up and cause her to surge about and "whip" in the air.

Upper Portion of the Airship Mooring Mast Erected at Pulham, England

(Photo Underwood & Underwood)

To release an airship from a mooring mast, it is only necessary to let down a pendant from her nose through the revolving cylinder where a tension is put on it by a hand reel in the top of the mast, and the strain is held until the locking springs are free. In the meantime the after engine has been started to neutralize the force of the wind which tends to drive the airship astern. When all is ready, the ramaining engines are started up, the locking springs are pulled back, and the ship rises free from the mast.

These masts do away with landing dangers in inclement weather. They also make it easier for passengers to enter the ship, for, after the passengers are landed in the revolving platform, they merely step through an "accordion" doorway similar to the connection between parlor cars on a passenger train, and walk down the passage into the ship's cabins.

Mooring masts in the United States will prove the extraordinary value on account of the tremendous extent of the country. An airship corporation need only have terminals stretched across the country. All intermediate stops will be made at masts, reducing the personnel overhead and expediting the ship when enroute, little delay occasioned in mooring with the new device.—*Navy News Bureau*

* This mast, located at Pulham, is shown in the accompanying illustration.

Air Mail Uses Bascule Door Hangar

The large hangar at the Air Mail station, Reno, Nev., which is illustrated below, marks a new and radical departure in hangar construction. The structure is the design of J. B. Strauss, president of the Strauss Bascule Bridge Co., of Chicago, internationally know as an engineer and inventor.

The principles followed in the design of this hangar are those underlying the Strauss Bascule Bridge, which made the name of its inventor famous. The dimensions of the building are 105 ft. x 105 ft. over all, with a clear vertical head room of 18 ft.

The hangar is capable of holding eight DeHaviland 4-M planes, the type now in use for the air mail service, and will have a complete work shop for building and repairing air planes.

The door, 100 ft. long and 21 ft. high, is hung on pivots or trunnions at the top of the door jamb and swings outwardly

Steel Bascule Door Hangar at the Air Mail Station Reno, Nev., Designed by J. B. Strauss

to open, being counterbalanced by a concrete counter-weight, weighing 37,500 lb., so that it is in exact equilibrium. The counterweight is always held in a vertical position by means of a counterweight link, which has been connected to the counterweight frame and a fixed roof truss. The power required to operate the door, therefore, is very slight. A 5 hp. motor is used, operating a train of gears, which in turn operate two operating pinions, engaging two cast iron racks, bolted to the door girders.

Another interesting feature is the steel framework, which is so designed that it can be completely assembled in the field without rivets, thus permitting quick erection and as rapid dismantling. The design will be of great value to the aviation generally, for it marks a great advance in speed of opening and dependability over the various forms of cumbersome sliding doors and other types heretofore employed. Besides, it eliminates wind eddies such as occur with ordinary doors.

The time of opening the door is 20 sec. The structural steel frame is covered with corrugated asbestos sheating, and corrugated wire glass, and is absolutely fireproof throughout.

F. B. Elbrick is the representative engineer for Mr. Strauss, in charge of the construction of the hangar. S. H. Newton, of Reno, Nev., was the contractor for the erection.

The Strauss Bascule Door Hangars are designed in two types, Type A and Type B.

Type A hangar has a single leaf bascule door as shown in the accompanying photograph. This is applicable to hangars for airplanes and seaplanes and in general all heavier-than-air machines. The bascule door is a trussed steel frame with concrete counterweight and the same type of counter-weighting mechanism as employed in the Strauss Bascule Bridge. It is pivoted on three trunnions mounted in the bottom chord of the roof truss at the door end of the building. The door swings outward and upward and can be opened or closed with a minimum of effort, but cannot be opened readily by tamperers. Both electric operation (from a switchboard at the side) and hand operation are provided.

In the sill of the door a steam pipe may be provided to prevent sleet and ice from interfering with the movement of the door in severe winter weather. When open the door completely eliminates wind eddies. When fully closed the door flanges fit over the door jamb, preventing heat loss.

The framework of the hangar comprises structural steel roof trusses mounted on latticed steel posts. The posts are exceptionally wide and stable and are provided at the top with a reentrant head. The trusses have two main frames which are separate truss sections or units. At the apex these trusses abut and at the eave ends they interlock in the reentrant head of the posts. These sections are separately erected and connected at the bottom by the bottom tie which also interlocks. Braces are provided on the upper end members of the truss connecting to extensions of the post, which eliminates the knee brace and gives the full door width. The longitudinal struts between the posts are also provided with interlocking connections with the posts and all these interlocking connections are bolted.

The connection of the purlins to the trusses and posts is effected in the ordinary manner. The corrugated asbestos roofing and sheathing, being light, is readily secured in place. Thus the entire construction provides for the reduction and the simplification of field labor, which has become the present day necessity. The door and windows are standard fittings as specified by the purchaser and the heating and lighting and other accessories may all be installed at the purchaser's option. The foundation and the floor are preferably of concrete, as shown.

Type B hangar has a double leaf bascule door. The upper leaf is similar to the single leaf design, type A; the lower leaf is practically identical with the upper leaf except that the counterweight is pivoted below the leaf instead of above it and moves in a small watertight concrete box formed in the sill of the door.

The general design and operating mechanism are identical with that already described for the single leaf door of type A. The door opens from the center, the two leaves operating simultaneously and moving away from each other, one up and one down. The upper leaf forms a canopy over the door entrance as in Type A while the lower leaf forms an apron over which the machines may pass into the interior of the hangar. The counterweight receptacle for the lower door section can readily be made watertight as in bascule bridges so that no difficulty need be expected from this source. The construction of the remainder of the hangar is as already described for Type A.

This design has in general the advantages of design A with the additional advantage, as stated, that the lower door forms a runway which, in certain instances, as for instance in the case of seaplanes, may be found very desirable. It also has the advantage of being in two sections and for this reason it is well suited for the larger size doors. Where it is impractical, however, to have a counterweight pocket or where for any other reason the dropping of the door to the ground level is objectionable, a special door will be found the ideal construction for large size doors. This design is applicable to doors in excess of 100 ft. width and height.

The Strauss Bascule Door and Hangar, including the quick assembly roof is protected by patents pending and issued to J. B. Strauss, C. E.

Schneider Seaplane Cup Race

The Aero Club of America has received the following letter from Major J. E. Chaney, Assistant Military Attache, Rome, Italy:

The International Seaplane Race for the Schneider Cup will take place at Venice on August, 6 and 7, 1921. The Italians state that both the English and French will be represented in this year's contest and are very anxious to have one or more American representatives in the race.

The final arrangements for this race were made in Rome on April 6. I am enclosing herewith an extract from my report on this race to the Chief of Air Service, which will give the details of this year's contest.

Conditions of the Contest

Final and definite arrangements for the Schneider International Cup Race for Seaplanes for the year 1921 were made in Rome on April 6, 1921. The contest this year will take place on August 6 and 7 at the Lido, opposite Venice.

The contest will be over a triangular course; the total course being 200 nautical miles. All contestants must qualify in a water tightness test and a navigability test before competing in the speed test. Landing will be permitted. Only three machines and pilots of any one country will be permitted to enter the contest. The machines will be seaplanes or flying boats. The seaplanes representing Italy will be chosen by elimination, except that the firm winning the race last year will be permitted to enter at least one contestant. The start and finish will be made in full flight.

Prizes

1st Schneider Cup. Value, French Francs, 25,000. Last year in this contest there were additional cash prizes amounting to French francs 50,000. No such prizes have been offered so far this year's contest but before Aug. 6, it is very probable that some cash prizes will be offered. The Italian Naval Air Service has agreed to purchase the winning machine, which is a great incentive to Italian constructing firms.

2nd Half of total of all entrance fees.

3rd Third of total of all entrance fees.

4th Remainder of all entrance fees.

Special Tests

The other special regulations covering this race for 1921 are as follows:

(a) Clubs entering machines must deposit, in addition to the entry fee laid down in the General Regulations, a sum of 5,000 francs for each machine, as a guarantee of its being present for the contest. This sum will be returned in respect of each machine that is present.

(b) Water-tightness test.—The contest will begin with a test of the water-tightness of the floats, which will precede the navigability test.

(c) The machine must be in flying order, with or without the crew, and ready to start. Each seaplane contesting will be compelled to carry during the race the amount of water taken in during the 6-hr. test for water tightness.

(d) Navigability test.—The navigability test will follow the water-tightness test. It will take place for all competitors on the same day or during the two days preceding the contest for the Cup, in the order drawn by lots.

(e) The Commissaires Sportifs may allow competitors who have not passed the navigability test to make a second and final attempt immediately.

(f) Each machine, in flying order, will cover in a closed circuit over the sea a distance of 5 to 10 miles. The exact distance will be fixed by the Commissaires Sportifs.

(g) After taxying over the starting line, the machine must rise and continue the course in flight; during this flight the machine must be taxied over two distances of ¼ miles, the limits of which will be indicated by two buoys; it must then rise and complete the circuit, alighting again before the starting line, and taxying over.

(h) Machines must not undergo any modification between the navigability test and the completion of the contest. Machines will be stamped to ensure this.

(i) Machines taking part in the speed contest must be in the same condition as for the navigability test.

(j) In the event of damage during the latter test, the necessary repairs may be carried out at sea, but these must not alter the original condition in which the machine was presented.

Peking-Shanghai Air Transport Service

The Department of Aeronautics of China, under the direction of General Manhan K. Tinn, is now busily engaged in formulating plans for operation of the proposed Peking-Shanghai mail service. The problem before the department is the development of emergency landing fields to be used in case of engine trouble. Nanking and several other important cities will also benefit by this service. Parcels post will also be carried. Passenger transportation will be developed by a private corporation. It is understood that a very strong Chinese company is now endeavoring to secure the services of a well known aeronautical engineer who was recently in Peking negotiating with the Chinese Government for one of America's largest aircraft manufacturers. It is understood that these aerial lines were to have been put in operation about the first of April.

In February, 1919, the Department of Communications purchased six Handley Page converted bombers for the mail service. These machines have recently been turned over to the War Department. A large order for aircraft was recently placed for Vickers-Vimy-Rolls machines.

Capt. Tom Gono is chief of the Canton A.S. Department with several pilots under him. They have a couple of training planes of no obsolete type.

The Navy sent four officers with Major J. E. H. Stevenot to attend the Curtiss aviation school at Manila. Commander Wong reports that the students are progressing satisfactorily.

Army L.T.A. Craft at McCook Field

Lt. R. E. Thompson of the Balloon and Airship Experimental Station at Fort Omaha, Neb., arrived at McCook Field, Dayton, Ohio, last week in order to make preparatory plans for the removal of the station from Fort Omaha to Dayton. The remaining personnel of the organization, consisting of Captain Allen P. McFarland and thirty-four civilians, will follow as soon as plans are completed to effect the removal.

The consolidation of the Balloon and Airship Experimental Station with the Engineering Division, Air Service will place the engineering of lighter-than-air craft development under the direction of Major Bane.

Landing Field Notes

Boston Plans Municipal Air Port

Establishment of a municipal airport in Boston is being hastened by representatives of the Boston Chamber of Commerce, postal officials, trade and aviation interests throughout New England. According to Major Leonard H. Drennan, Air Service Officer of the First Army Corp, a survey of available land developed that the filled in land between Castle Island and City Point is the only suitable point for a Boston airport.

Nathan Heard of the Boston Chamber of Commerce, chairman of the landing field committee, reportrd that a real movement has been started to locate a municipal airport and that the Chamber is backing the project. He declared that conferences will be askrd of the Governor and Commissioner of Public Works before details of the project are made public.

York, Pa., to Have Landing Field

The possibility of establishing a landing field at York, Pa., is under discussion by the executive committee of the York Chamber of Commerce, and it has been decided that such a station will be of much advantage to the city. An automobile parking place will be projected, in connection with the proposed aero station. The whole matter is in the hands of a committee composed of Fred Demwolf, Russel Zinn, John H. Rutter, William Ilgenfritz and J. W. Riehley. This committee includes two former aviators, two automobile men and one real estate expert.

Oshkosh Has Fine Air Port

Oshkosh, Wis., has one of the finest landing fields in the North West, according to a statement of W. A. Hallgren of Chippewa Falls, who recently landed there and was a guest of the Oshkosh Elks. Regarding his landing there, Mr. Hallgren said: "I was surprised at the up-to-date aviation field provided at Oshkosh. It is an ideal landing place and the hangar and repair and supply equipment, in charge of Aviators Richard Lutz and Florian Manor, give splendid service. I needed some repairs and had expected I would have to go elsewhere for them but when I approached this city I observed the landing field, while several miles from it, and I descended without difficulty and found everything any flyer would need. This city is to be congratulated on its air station."

Chicago to Have Municipal Air Port

A municipal landing field for airplanes within the city limits of Chicago is to become an accomplished fact on July 31, according to plans formulated by the council aviation committee of that city. Ald. Frank J. Link, chairman, was directed to have an ordinance drawn up declaring a strip of land 500 ft. wide and 1,000 ft. long, south and west of the Municipal pier, a city landing field. The land is the property of the city.

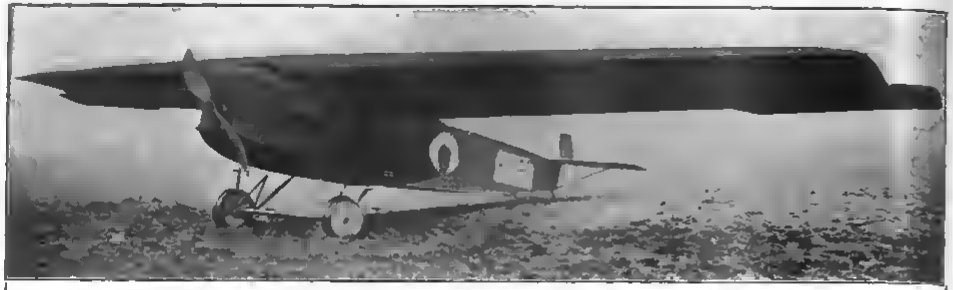
Lexington, Ky., May Figure on Air Map

The Board of Commerce of Lexington, Ky., has received a request from Major Ira Longaneeker, in command of Air Service headquarters for the 5th Corps Area, at Fort Benjamin Harrison, Ind., for information regarding a possible site for a landing field near Lexington for the use of military and civilian aircraft. The board has decided to give the Air Service every possible assistance in this connection.

On the other hand an aircraft firm has been organized at Lexington under the name of Lexington Aviation Co., which intends to establish a flying field of its own and to engage in commercial flying.

Landing Field at Peoria, Ill.

As a result of the efforts of the Aircraft Club at Peoria, Ill., that city now has a landing field of 40 acres area, which is marked with a white cross 100 ft. in diameter and 4 ft. wide. The field is said to be excellent, being flat as a billiard table and covered with alfalfa, clover and pasturage. It is situated one half mile north of Kellar Station, on the east side of the Mt. Holly cement road.



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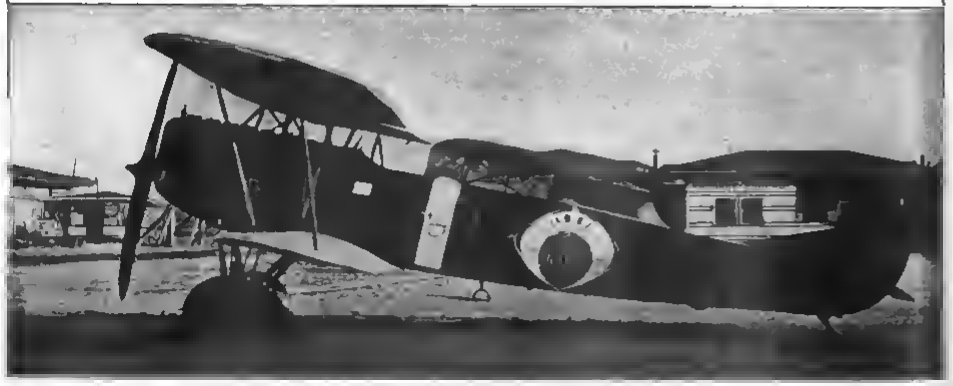

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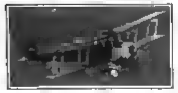

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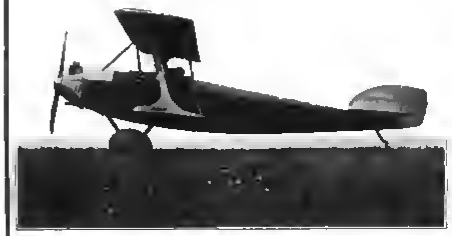

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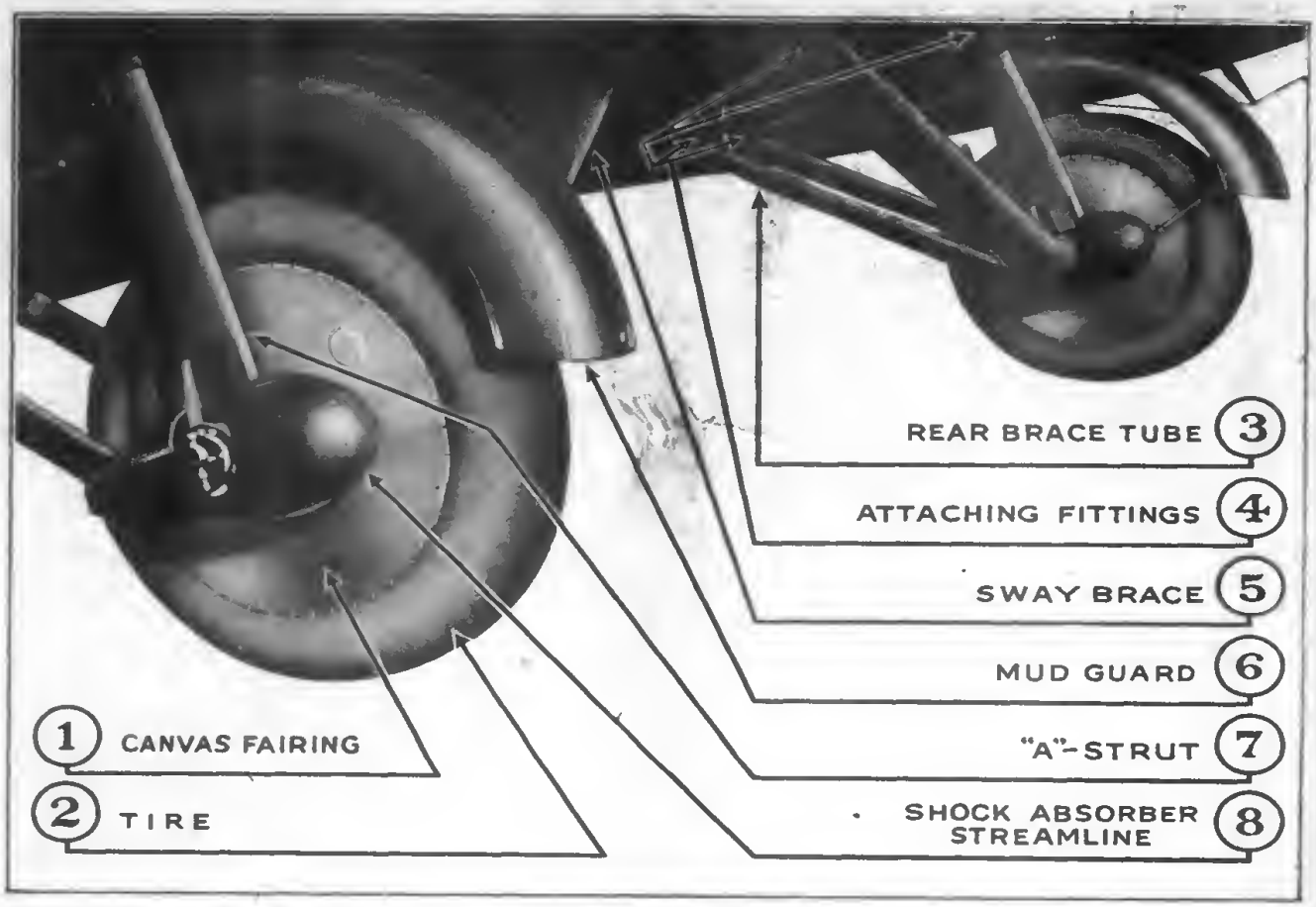

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